REPORT OF EMEC WORKSHOP, 3 SEPTEMBER 2008.

ENVIRONMENTAL PROTECTION AND MANAGEMENT FOR WAVE AND TIDAL ENERGY CONVERTORS: BEST PRACTICE APPROACHES

Venue: BMA building, Queen Street, Edinburgh
Facilitators: Liz Foubister (Xodus AURORA) and Steve Hull (ABPMer).
Attendees: Representatives of UK regulators, consultees, developers, power generators, research organisations. A full list is included as Appendix I.

1 Background

BERR and the Scottish Government are funding EMEC to facilitate the production of standards for the wave and tidal energy industries (http://www.emec.org.uk/national_standards.asp). The development of the majority of these standards is well progressed. The workshop held on 3 September 2008 was originally envisaged as a step towards an environmental standard, or guideline, which BERR had agreed to fund. Such a standard would be based upon consensus on the potential for environmental impacts of marine (wave and tidal stream) energy conversion devices. The conceptual aim of an environmental standard is to establish how impacts should be assessed, and how appropriate mitigation measures and monitoring activity should be defined.

Regulators, developers and other stakeholders are becoming more aware of the environmental aspects of renewable energy devices, and the interaction of environmental sensitivities with device design, siting and aspects of licensing and consenting. This has been reflected in the Scottish Government's commissioning of a Strategic Environmental Assessment (SEA) for wave and tidal energy generation to the north and west of Scotland, and the subsequent Strategic Environmental Research Assessment. The latter document sought to identify the main areas of uncertainty in assessment of the environmental interactions of wave and tidal devices, and included a structured approach to filling these gaps, based around the development of a spatial planning system and guidelines for EIA for wet renewables.

A completed environmental standard would assist all concerned with the development of the wave and tidal energy industries. Specifically, it would inform:

- regulators and their advisors across the UK and potentially internationally;
- potential project developers of key environmental considerations for device/array design;
- developers and their contractors on the level of impact assessment studies likely to be associated with the development of commercial arrays (which are likely to be required to support the consenting and EIA process);
- developers, regulators and advisors on likely mitigation strategies and monitoring requirements;
- policy makers on the extent of information needed to fully develop these industries.

2 September 3rd 2008 Workshop - Structure

The original concept of the workshop held on Wednesday 3rd September at the British Medical Association in Edinburgh was that it would be the first step towards an environmental standard, as described above. However, the drafting of a UK Marine Bill, and other activities related to marine energy development, led BERR to conclude that it was too early to undertake the drafting of an environmental standard.

In preparation for the meeting as originally conceived, EMEC circulated a list of "impact topics" and of objectives for the Workshop (Appendix II). This comprehensive list had been developed from the EMEC EIA Guidance and sought to capture the major environmental issues that could arise in relation to wave and tidal energy projects.

The change in status of the Workshop, and the need to have an output document that contributed to the assessment of environmental interactions of renewables devices, necessitated a re-scoping of the tasks for the Workshop. In preparation for the Workshop, it became clear that there was enthusiasm among expected attendees to pool knowledge and experience and to seek to achieve consensus over the identification and prioritisation of environmental issues. The tasks for the Workshop were therefore redefined as:

1) To agree on the range of relevant environmental issues (to be developed from Column 1 of Appendix II).
2) To agree a prioritisation of these potential key issues, in relation to their potential to hinder the development of test sites or commercial arrays
3) To focus on those issues which are 'unique' to the marine renewables industry, rather than discussing issues such as onshore impacts, etc., and for which there are generally guidelines and best approaches to monitoring already available.
4) To identify existing approaches to monitoring that has been, or is being put in place in regard to assessment of the issues being discussed.
5) To identify critical gaps in knowledge that may hinder development.

The output from the Workshop would be available for use in related work, or may be continued towards an environmental standard (or other output).

3 September 3rd 2008 Workshop - Output

The Workshop discussion ranged widely over the potential marine issues arising from wet renewables developments. No significant attention was given to on-shore issues, such as the need for shore bases for developers and service companies, works required for connection to the gird, etc. Terrestrial interactions were largely outside the scope of the Workshop, as in most cases the issues that are likely to arise are not unique to renewable energy developments, and are addressed through existing consenting processes, for example Planning Consents for construction.

As background to the discussions, it was noted that a range of Governmental and other initiatives were actively influencing the research, development and exploitation climates. These included:

- Scottish Government SEA for wet renewables
- Consequent processes, such as consultations and a Post Adoption Statement
- Scottish Government Strategic Environmental Research Assessment for wet renewables
- Creation of Scottish Government Marine Energy Policy Group (now Marine Energy Spatial Planning Group), and associated sub-groups
- Pentland Firth Tidal Energy Project
- The Crown Estate licensing invitation
- Continuation of Research Council initiatives, such as Supergen
- European research initiatives, such as Equimar.

The following table summarises the views of the Workshop on the relative priority of marine environmental issues in planning for the future development of the wave and tidal stream industries.

Receptor of interaction	Nature of interaction	Priority	Comments	What already exists, what needs to be developed?
Wildlife, particularly marine mammals ands birds, but including a few other species such as basking sharks	Collision with devices, particularly tidal turbines.	H	This is a high priority area. The potential for acute incidents clearly exists. However, this is tempered by expert judgement that suggests that mammals may well be able to detect and avoid turbines. Also, the entrainment of almost neutrally buoyant birds and mammals in the flow of water through turbines may tend to limit the potential for impact with the turbine rotors. This is a high priority area for hydraulic modelling, field observation (including the development of observing techniques/devices), and supporting population dynamics of vulnerable species.	EQIMAR – collision risk model being developed. Will be publically available by 2010? Results published in the interim. Concentrate on seals. Wave and tidal considerations. EMEC / SMRU Ltd – further developments to active sonar (tested at MCT) - involving sonar developers. Sonar technology to be developed and tested at EMEC and Strangford. East River New York City – active sonar been used to count fish. Underway cameras – operational and maintenance issues – not very practical. Ben Wilson SAMS –collision risk research. MCT – strain gauges, active sonar, MMOs. Active sonar range – is it good enough – what range required. Image recognition patterns – leading edge. Diving birds will be a major issue with regards to offshore extended SPAs. ICIT (Norris MSc + ongoing?) – passive acoustic monitoring of diving seabirds. Not suitable for tidal sites? EMEC high resolution camera at the wave test site – surface observations of wildlife surface interactions. Looking to get same technology at tidal site. Looking to correlate data collection by physical observer overlooking site, and by

				camera, with a view to recommendations for future monitoring by observer &/or camera. Hydrodynamic modelling undertaken to date suggests birds and fish will flow round devices. Interim guidance to developers – instrumentation expected to be part of the design – requirement for data analysis. Very difficult to scale up test device monitoring data to commercial arrays. Developers therefore expected to monitor commercial arrays in the first instance, but using info gleaned from testing as much as possible. EMEC MMO procedure developed with SNH. Scottish marine renewables SEA collision risk study – list of gaps and recommended studies (chapter 11).
	Alteration to wildlife behaviour. For example, reduction in access to feeding areas (mammals and birds), avoidance arising from "barrier effects" of arrays of devices in restricted waters.	H	High priority area. There are some field observations that may suggest that marine developments and associated boat activity (disturbance) may alter behaviour. However, the observations are often not directly relevant to wave and tidal devices, and often do not provide information on the likely duration/persistence of effects. Modelling is currently unreliable, as prediction of the likely responses is difficult. There is no useful information on "barrier effects". Opportunities must be taken at test sites and early commercial deployments to gather field observational data.	Potentially major issue if proposed development on a transit route or migratory route. Causeway examples – western Isles – SNH reports. Aggregate industry experience – e.g. in the Wash, SE coast of England. Cumulative effects – flow, noise, vibration effects. Better understand individual devices first. Best practice guidance required? Monitoring programme where the risk is deemed to be greatest?
	Entanglement of wildlife in moorings	L	At the current time, this is a theoretical possibility normally expressed in terms of large marine mammals becoming entangled in the mooring and electrical cabling systems of wave device arrays. We are not aware of any	Minor issue – not likely to have significant effect

			documented instance of this being a significant problem, but the possibility should be taken into account when designing post-installation monitoring programmes.	
	Damage to hearing (mammals and fish) primarily from survey (e.g. seismics) activities, and construction work (pile driving)	L	These are important matters that need to be considered in project development and EIAs. However, they are not unique to marine renewables, and there is considerable experience in other contexts of appropriate licence conditions and mitigations to reduce the potential for impacts.	COWRIE – behavioural responses of fish to piling. Maryland Uni looking at physiologicical effects. Opportunities to link up the two pieces of research. Aggregate industry – monitoring studies been undertaken dab, plaice, fish, Oil industry seismic survey. JNCC wind farm piling – Annex to deliberate disturbance guidance. Technology to measure the noise required first. The need to look at how animals will respond to the noise. Device specific requirement for noise monitoring requirements – wave and tidal energy devices. MFA – guidance – good practice techniques for construction, installation and operation - 2009
	Underwater noise - construction	L	As noted above, there is considerable experience in other contexts of appropriate licence conditions and mitigations to reduce the potential for impacts from typical construction noise arising from the short-term activities such as emplacement of gravity foundations or pile driving. Codes of practice to minimise impacts are well established	WEAM - wave energy centre project – operational noise from 3 wave devices. characterise acoustic signatures US noise modelling experience Technology to measure the noise required first. Need to look at how animals will respond to the noise. Device specific requirement for noise monitoring requirements – wave and energy devices. MFA – guidance – good practice techniques for construction, installation and operation - 2009
	Underwater noise -	M	There is currently some uncertainty about the	EMEC tidal site – drifter hydrophones. Baseline

	operation		character and intensity of underwater noise that will occur during operation of both wave and tidal devices. Direct observations are required of the current sound characteristics of potential development areas, and of the sound emitted by devices. Interpretation of the significance of operational noise for wildlife is likely to require direct field observations.	measurements have been taken. – appropriate to tidal technology only. Not yet done for wave site, but funding being sought. Methodology for wave site characterisation – funding being sought.
Seabed, habitats and species	Physical disturbance of the seabed	M	The main direct physical disturbance of the sea bed will occur when moorings/footings are being created. The environmental significance of these works will depend upon the conservation status (designations if any) of the area of seabed being used. The importance of impacts can be managed to a large degree through informed site selection.	JNCC guidance on baseline survey requirements – side scan sonar, seabed imagery. CEFAS benthic survey methodologies – but how relevant to high flow environments. Developers had a significant need from an operational perspective. But need to ensure that at the same time collate data that can be appropriately interpreted from an environmental perspective. EMEC ROV research project (BERR). EMEC – developed ROV guidance for surveys (with FRS). FRS underwater video footage of Pentland Firth and West Coast areas. FRS working with Scottish Renewables programme – areas of interest (~30 dots) going to be swathe bathymetry, Roxanne, ground truthing drop frame camera? ADCP profiling – 3D current structures. October 2008 first cruise. First of a series. Data available to SR members. Diver surveys have been invaluable for MCT. Particular in relation to position issues. MCA huge swath programme for north of

				Scotland area. Swathe bathymetry coast around Northern Ireland – NIEA. How do you survey high flow sites – guidance needed. Significant benefits from the pooling of knowledge – list of experience of best practices. CAN'T UNDER-EMPHASISE THE ISSUES OF OPERATING IN THESE DYNAMIC ENVIRONMENTS! Tidal – particularly an issue.
	Alteration to sediment movements	L	This can arise by various mechanisms, including alteration in flow patterns around moorings/footings (scour), and alterations in the bulk flow over wider areas. Scour is not unique to renewables developments. Regulators have considerable experience elsewhere which can be used to address this particular application. Generally, scour is found to be a very localised effect, which can be minimised by site selection, if necessary. Alterations to bulk flow will only become an issue when commercial tidal stream arrays are being considered. Changes in flow and sediment movements can be addressed through numerical modelling	
	Alterations to benthic faunal communities through changes in flow or wave exposure.	M	Only likely to be a significant regulatory issue problem in designated/protected areas, and probably manageable through informed site selection. Work is required to establish the distribution of seabed habitats in potential development areas. Changes in wave fields can be predicted, as can effects at smaller scales on eddies, wakes etc. leading to general predictions of changes to hydrodynamics. These should be assessed in relation to protected areas or priority habitats	Wind farm guidance on coastal processes assessment – BERR. COWRIE study for coastal processes. How effective have previous modelling studies been. Wave energy centre project - study completed and paper/article published. BERR published new guideline on measurement of energy extraction from tidal turbines.

			and ecological status under WFD, which may therefore provide an assessment tool. "Shadow effect" of wave farms may take a long term monitoring before any impacts are detectable.	MCCIP programme – important overlap her with regard to longer term variations/natural variability. See flip chart notes. What is the biological response to the physical changes?? Wave Hub project – consent conditions determining effects of coastal processes from the Wave Hub. Comprehensive monitoring programme. Study of optimisation of turbine tidal and wave arrays ongoing as part of SUPERGEN. Modelling as part of design process can be used to infer environmental impacts. Any research should be strategic not solely site/development specific. Time right for experimental studies to move to being in a proactive position rather than reactive.
	Vibration	L	Expert judgment suggest that vibration of the sea bed from (wave or) tidal devices causes significant environmental impacts.	
Navigation	Surface vessels, merchant shipping, fishing vessels, naval vessels	H	It is a high priority matter to open conversations with these important user groups with a view to improving the understanding of the requirements of the various sectors and how these and the need to develop wet renewable energy schemes can be integrated.	Regulated by MCA and MGN 371/372 guidance EMEC ongoing discussions with MCA – generic patterns re navigational marking, bouyage, under keel clearances etc. Scottish Government – some sort of government level approach to set out ground rules (under Marine Spatial Planning). Wave hub conditions – emergency response plan – active safety management plan – sharing

				of info into how to develop these plans Marine spatial planning issue PHA project specific analysis that influences survey requirements.
	Submarine navigation	H	Potentially a very important issue. Requires interaction of regulators with MOD.	Acoustic output of devices – concerns. But reluctant to share frequency etc info. EMEC ongoing liaison with MOD. Raise issue with BERR/SG as a strategic issue
Commercial fisheries	Limitation of access of fishers to actual or potential fishing grounds	H	This is a very important issue that will need to be resolved by MSP.	Plymouth – research into reef effects of offshore wind farms Oil industry research – ICES research FP7 proposal MESMA – spatial managed areas MFA – analysing data collected from existing windfarms on fish aggregation EMEC small scale research/monitoring programme seeking funding, on no-take areas. Local study. Quantum jump in applying to size of areas likely to be needed for commercial scale wave developments. Scottish industry would like to hold strategic discussions on a similar issue to the oil and gas industry pipeline agreement. Will make local negotiations a lot easier if strategic agreements/guidance in place – difficult precedent? Marine spatial planning issue. Damage to gear versus exclusion to fishing grounds.
	Impacts on fish spawning grounds	L	While activities such as seismic surveys or seabed construction clearly have the potential to adversely affect fish spawning grounds, there is considerable experience of managing these activities in other contexts that will be transferable to renewable energy development.	

	Direct impacts of devices on fish	L	Collision with devices is unlikely to result in significant mortalities of fish. Reports of adverse effects of pressure changes in turbines on larval fish should be addressed, initially by a numerical modelling approach, but again expert judgement suggests that the impacts will be small. It has been suggested that underwater power transmission cables may present barriers to fish migration. This is not unique to renewable energy developments, and experience elsewhere should be utilised to minimise the potential for effects.	
Marine productivity	Alteration of primary production in development areas	L	It is possible that the extraction of energy by both wave and tidal devices may reduce turbulence and vertical mixing in and downstream of development areas, and thereby affect the stability/stratification of the water column. In turn, this may alter nutrient availability and the rates of primary production. Expert judgement suggests that this process will be of minor importance, particularly in the high energy environments where devices will be deployed. The issue can be addressed through numerical modelling, if necessary.	
Aesthetic impact	Visual impact of objects on the sea surface	M	There is no standard technique for assessing the significance of objects on the sea surface. In E/W, an exclusion zone round the coast of 13(?) km operates for windfarms, but this is not directly transferable to wave/tidal stream devices. Some parallels may be drawn with fish farms, for a which a code of design practice has developed covering colour of installations, height of structures, relationship to background at viewpoints, etc.	SNH research 2005 – Seascape assessment guidelines (windfarms) – SNH report 103. NI and SNH – fish farm/aquaculture guidance CCW – seascape character assessments. IALA – international association of lighthouse authorities RAG research project into seascape – scope being developed Guidance in assessment methodology requiring to be developed
	Impact on marine (underwater) landscape	M	No guidance is available on this issue, regarding either assessment of impact or mitigation measures.	
Miscellaneous. This section covers a	Leaching of antifoulants from devices	L	Covered by other legislation, and impacts assessed through water Framework Directive	

very wide range of forms of interaction with the marine environment. Almost all are not unique to wave and tidal energy developments and are well managed in other contexts.			standards and monitoring/classification.	
	Chemical and oil spill risks	L	Covered by mitigation measures in project design.	
	Redistribution of contaminants, primarily contaminated sediment	L	Unlikely to be a significant consideration in likely Scottish wave and tidal development areas, which are remote from significant industrial inputs of contaminants	
	Changes in turbidity	L	Only likely to be during construction, and to be transient.	
	Debris loss	L	Possibility at all stages of construction and maintenance. Project plans should include appropriate measures for minimisation of loss and recovery of lost items.	
	Impacts on marine archaeology	L	Covered by existing consultation procedures.	Regulated/controlled by English Heritage/Historic Scotland Joint nautical Archaeology policy committee in addition to Aggregate industry have a lot of best practice guidance – how applicable – too over the top? Uncertainty in the management of marine historic landscapes going to change – different types of designated sites
	Recreational users	L/M	Recreational uses of potential development areas include yachting, sea kayaking, diving, etc. These are significant in some areas, but not in others. It will be important to ensure that these activities are taken into account when planning the mix of activities to take place in specific areas of coastal waters.	

4 September 3rd 2008 Workshop – The Way Forward

Having developed the assessments of priorities outlined in the above table, the Workshop then considered the opportunities for taking the work forward, such that it would contribute in other fora and assist the development of the industry. It was agreed that:

1. FRS / EMEC would complete the report of the meeting and EMEC establish a discussion board on its website to enable initial discussion amongst meeting attendees on workshop outputs.
2. The report would be fed into appropriate groups/processes including Scottish Government MESPG, BERR, and COWRIE
3. Full advantage should be taken of test devices and small scale arrays to undertake the field research and observations necessary to reduce the uncertainties in priority environmental interactions, which will become even more pressing when commercial scale arrays are proposed.
4. Generic monitoring or research needs should be identified from the prioritised list with a view to the work being funded by Government or research Councils
5. Wet renewables could be a good topic for consideration at a meeting of the cross-administration FEPA Regulators Group, which had not met recently. The aim would be to develop a consistency of approach to FEPA licensing of wave and tidal devices throughout the UK.
6. Research opportunities should be assessed in relation to the BERR RAG priorities and/or fed into the RAG process.
7. Wet renewables could usefully be discussed at the conservation agencies Marine Industries Working Group.
8. Opportunites for international collaboration should be explored, for example through the UK/Canada bilateral meeting planned for late September 2008.
9. ICES should be approached with a view to exploring whether wet renewables fell within the remit of any of their current Working Groups, or whether new WG should be proposed, perhaps following a targeted Theme session at an ICES Annual Science Conference.

Appendix 1

List of attendees:

Attendees - Environmental Standard:
BMA, Edinburgh 3 Sept, 2008

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Appendix II Impact topics (initial list)

The table presented on the following pages provides an initial list on proposed impact topics. The workshop will include finalising an agreed version of the proposed list and populating the content of the remaining columns. The table has been populated making reference to Scottish Marine Renewables SEA (Scottish Marine Renewables Strategic Environmental Assessment (SEA) Report prepared for the Scottish Executive by Faber Maunsell and Metoc plc, March 2007).

It should be noted that the table is not intended to be an EIA checklist, but to identify the key impact topics that require consideration as part of the EMEC standards work. As many of the topic areas and impacts are interrelated the list has tried to capture all issues without major repetition

Issue	What should be considered/ Why it is important	Environmental impacts of interest i.e. key issues *initial draft provided to be reviewed/built on at the workshop*	Baseline data required E.g. published data only, regional surveys, site specific surveys	Impact assessment strategies/methodologies What already exists, what needs to be developed?	Mitigation and management (inc design based) strategies	Monitoring requirements
Offshore issues						
1. Ecological energy balances and flows	Consequence of energy extraction and physical presence of devices in the sea should be assessed, e.g. changes in vertical mixing, may lead to changes in offshore and coastal habitats/features and knock on effects to biological communities present.	Changes in wave exposure.				
		Changes in water flow.				
		Changes in productivity.				
		Increased predation on marine species.				
2. Disturbance to seabed habitats	Anchoring, mooring/foundation installation, operation and maintenance equipment and other seabed disturbances can lead to disturbance/destruction of seabed habitats. Consideration should also be given to the potential disturbance of contaminated sediments.	Change in seabed morphology.				
		Change in sediment processes.				
		Change in coastal processes.				
		Increased sediment / sediment turbidity.				
		Remobilisation of contaminated sediments.				
		Potential disturbance to munitions.				
3. Physical disturbance to water masses	The scale and implications of changes to such factors as nutrients, temperature, light levels, turbidity (suspended sediments), surface waves and current patterns should be considered.	Changes in sediment processes.				
4. Behavioural changes in wildlife (including displacement)	Activities have the potential to affect the distribution of wildlife. The potential influence of activities and facilities upon wildlife, in particular those protected by European Directives and national legislation (also see issue 5) should be considered. Issues might include	Impacts on marine mammals (seals and cetaceans) from underwater noise, vibration and light.				
		Electromagnetic and electrical effects on				

Issue	What should be considered/ Why it is important	Environmental impacts of interest i.e. key issues *initial draft provided to be reviewed/built on at the workshop*	Baseline data required E.g. published data only, regional surveys, site specific surveys	Impact assessment strategies/methodologies What already exists, what needs to be developed?	Mitigation and management (inc design based) strategies	Monitoring requirements
	displacement of species from breeding (e.g. nesting for birds, spawning for fish etc) and feeding area, disturbance to feeding activities.	elasmobranchs from cables.				
		Physical displacement of birds from breeding and feeding areas.				
		Creation of resting and breeding habitat.				
		Impacts on fish (inc knock on effects on commercial fisheries and mariculture) from underwater noise, vibration and light (underwater and aerial).				
		Impacts on wildlife from airborne noise and light.				
5. Contamination of seawater, seabed and wildlife (inc fish stocks)	Contamination may result from effluent discharge, chemical discharge/leaching/leaks, oil discharge/leaks, sewage discharge, dumping of waste etc. All potential sources, planned or accidental should be identified and considered.	Disturbance of contaminated sediments.				
		Routine discharge of oil or chemical polluting the water column, seabed sediments, coastline.				
		Accidental discharges of oil or chemical polluting the water column, seabed sediments, coastline.				
6. Wildlife entanglement, entrapment and collision	The potential for damage and entrapment of wildlife in particular marine invertebrates, fish, mammals and birds, should be addressed in	Entrapment and collision of marine mammals (seals and cetaceans).				

Issue	What should be considered/ Why it is important	Environmental impacts of interest i.e. key issues *initial draft provided to be reviewed/built on at the workshop*	Baseline data required E.g. published data only, regional surveys, site specific surveys	Impact assessment strategies/methodologies What already exists, what needs to be developed?	Mitigation and management (inc design based) strategies	Monitoring requirements
	relation to structure, operation, season, and location. Impacts may include entanglement or collision with any blades/rotors, jamming in joints, entrapment etc.	Entrapment and collision of diving birds.				
		Entrapment and collision of fish.				
7. Visual, seascape and landscape impacts (above water)	Devices visible from the coast and at sea may affect the seascape, landscape and visual qualities of particular views. Factors (within navigational requirements) that help structures blend in with or enhance the landscape are important. This can include colour, orientation, structural design, materials etc. Consider visibility distance of lights and ensure compliance with NLB requirements/recommendations.	Landscape and seascape impacts.				
		Visual impacts.				
8. Submerged landscape impacts	Submerged facilities/devices have the potential to affect submerged landscapes required.	Impacts on underwater cultural heritage.				
9. Navigation/sea user interference	The presence of devices and their mooring systems has the potential to interfere with vessels and other sea users e.g. navigation, MOD, cables and pipelines, sea disposal sites, fisheries, recreational and tourism interests etc.	Navigational interference.				
		Displacement from traditional fisheries.				
		Impact on mariculture activities.				
		Interference with MOD activities.				
		Interference with disposal sites.				
		Interference with cables and pipelines.				

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		Interference with recreational users.				
		Interference with tourism interests.				
Onshore issues						
10. Shoreline disturbance	Activities that have the potential to cause change to the coastline such as erosion/deposition, change in character, either directly or indirectly should be considered.					
11. Disturbance of landward areas	Siting of any onshore activities/works should avoid onshore habitats important from a conservation perspective and minimise the loss of natural habitat.					
12. Impacts on conservation areas/protected species (ecological)	Any interference with designated conservation areas and protected species, of international, national and local significance should be considered.					
13. Impacts on conservation areas/protected species (cultural heritage)	Any interference with designated conservation areas and protected species, of international, national and local significance should be considered.					
14. Impacts on geology, hydrology and hydrogeology	Cable landfalls and onshore facilities may result in impacts on the geological, hydrological and hydrogeological characteristics. Consideration should also be given to potential disturbance of contaminated land.					
15. Land user/development interference	The presence of onshore facilities has the potential to interfere with other land users / developments as well as future development policies e.g. traffic,					

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	industry, tourism, farming etc.					
16. Airborne noise, light and other nuisances	Airborne noise, light and other nuisances can affect wildlife (potentially offshore, coastal and onshore) and impinge upon coastal resident communities and recreational activities.					
General Issues						
17. Greenhouse gas emissions	Consideration should be given to potential greenhouse gas emissions e.g. from fuel use etc (from onshore and offshore activities).					
18. Local air quality issues	Any emissions of combusted or vented gases have the potential to reduce air quality (from onshore and offshore activities).					
19. Interference with communication systems	Some device to shore communications could interfere with normal shipping communications.					
20. Waste minimisation and disposal	All efforts should be made to minimise waste. Ensure suitable storage, transport and disposal for all waste streams. Some wastes will be able to follow existing waste disposal routes, others may not (from onshore and offshore activities).					
21. Accidental spillages and releases	Spillages of materials to sea have the potential to cause damage to wildlife and livelihoods e.g. fisheries. Appropriate procedures for accidental/emergency situations should be in place to minimise the potential for accidental releases.					

The proposed workshop is an information gathering exercise. There will be plenty of opportunity for open discussion about the issues, but not for individual or group presentations of delegates' work.

Specific aims are:

1) Agreement on the likely/possible range of impacts and receptors (marine and land based issues), building on issues specified in the EMEC EIA Guidelines to Developers.

2) Identification of/agreement on the key environmental impacts associated with marine renewable energy projects.

3) Identification of the appropriate methods/range of methods to assess each potential impact topic. How do we ensure accuracy in ascribing any effects to devices and how do we ensure consistency in interpretation of data acquired? Will include identification of the extent of current expertise in each of the impact areas and what further expertise needs to be developed and consideration of baseline monitoring requirements (regional versus developer specific data).

4) Identification of appropriate design, mitigation and monitoring (including where possible specific instrumentation/technology and length monitoring required) strategies for each key impact issue.

5) Agreement on document structure and content.

6) Explanation of and agreement on the document production process, proposed wider stakeholder consultation (including agreement on the proposed distribution list) etc.